

Correlation of skull fractures with the intracranial lesions in case of fatal road traffic accidents in Mangalore

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Abstract

Background: After road traffic accidents, skull fractures and intracranial lesions may develop. A strike to head with enough force ends with linear fractures. Skull fractures may be localized to the dome or base of the skull and may be linear, diastatic, depressed for fragmented in shape. **Aim:** To correlate skull fractures with the intracranial lesions in case of fatal road traffic accidents in Mangalore. **Material and Methods:** In this retrospective study, 286 cases with sustained fatal head injuries were studied. They were examined in detail according to their age, sex, skull fractures and intracranial lesions. Presence of any relationship between skull fractures and brain lesions were investigated. **Results:** Dominant type of skull fracture found was the linear fracture in 102 cases (35.7%) followed by comminuted fractures in 41 cases (14.4%). Subarachnoid hemorrhage was the commonest intracranial hemorrhage seen in 87% of cases. When the site of brain injury was analyzed, diffuse involvement of brain was seen in 93 cases (32.5%). **Conclusion:** Since fatal head injuries are the major cause of death it would be beneficial to educate the general public regarding management of such cases and also educate them of traffic emergencies (first aid) will be of high value

Key Word: head injury, road traffic accidents, skull fractures, intracranial lesions

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with linear fractures. Skull fractures may be localized to the dome or base of the skull and may be linear, diastatic, depressed for fragmented in shape. They may also be in form of open or closed fractures.^{2,4} Although developing skull fractures require a high degree of applied energy, there is a weak correlation between skull fractures and brain lesions.² The present study was conducted to correlate skull fractures with the intracranial lesions in case of fatal road traffic accidents in Mangalore.

MATERIAL AND METHODS

All cases of road traffic accidents involving fatal head injuries which underwent autopsy over a period of five years were included in the study. Among 4271 cases autopsied during the period, 859 cases were due to road traffic accidents, out of which 346 cases were from Mangalore jurisdiction. The present study included all cases of fatal head injuries due to road traffic accidents in Mangalore jurisdiction. Out of the 346 cases of RTA autopsied from Mangalore jurisdiction, 286 cases (82.65%) were found to have sustained fatal head

INTRODUCTION

Road traffic injuries are one of the top three causes of death among individuals aged between 5 and 44 years and more people die in road accidents in India than anywhere else in the World.¹ As head is the most prominent vulnerable exposed part of the human body by virtue of its situation and to sustain serious and fatal injuries owing to the great risk of striking the head. After the trauma, blunt traumatic lesions of scalp and even more serious lesions such as skull fractures and intracranial lesions may develop. A strike to head with enough force ends

injuries. The data required for the study was collected and analyzed retrospectively from all these cases.

Inclusion criteria

- All cases of fatal head injuries due to road traffic accidents.

Exclusion criteria

- All other fatal head injury other than road traffic accidents.

A proforma was prepared accordingly to collect the data based on the deceased’s particulars, with complete external and internal examination in retrospective studies of those involved in fatal head injury cases due to road traffic accidents. Recorded details include name, age, sex, address, information furnished by the police in the inquest papers, postmortem reports, investigation reports if any and cause of death. The pathological features of these cases as scalp injury, pattern of skull fractures and intracranial hemorrhages and their distribution were noted. All the data obtained was kept anonymous to protect the identity of the deceased and also for confidential medico legal information.

RESULTS

Age of incidence among the individuals is broadly grouped into ten years range and the highest incidences of 56 cases were noticed among the age group of 20-29 years and 50-59 years respectively. On considering sex profile among deaths due to road traffic accidents, 247 cases (86.4%) were that of males and 39 cases (13.6%) of females out of total 286 cases. Diffuse extravasations of blood in the scalp were seen in 126 cases (44.1%). Localized extravasation of blood in the scalp was seen in occipital region in 30 cases (10.5%) followed by temporal region in 21 cases (7.3%), frontal region in 19 cases (6.6%) and parietal region in 7 cases (2.4%). The scalp contusions were seen in combination of frontal, parietal and temporal regions in 31 cases (10.8%) followed by parietal, temporal and occipital regions in 17 cases (5.9%) and frontal, temporal and occipital regions in 13 cases (4.5%). The involvement depends on the site of impact and on the side of the body on which the individual falls.

Table 1: Type of Fracture in Vault

Type of fracture in vault	Number of cases	Percentage
Absent	114	39.9
Linear	102	35.7
Linear+ Comminuted	9	3.1
Comminuted	41	14.4
Comminuted+ Depressed	6	2.1
Depressed	7	2.4
Diastatic	7	2.4
Others	0	0
Total	286	100.0

On considering the type of fracture in skull vault, out of 286 cases only 172 cases (60.1%) showed skull vault fractures. Linear fracture constituted most common type of fracture accounting for about 102 cases (35.7%), next common type of fracture being comminuted fractures in 41 cases (14.4%). The combination of linear fracture with comminuted fracture in 9 cases (3.1%) followed by depressed and diastatic fracture accounting for 7 cases (2.4%) respectively and a combination of comminuted with depressed fracture in 6 cases (2.1%). The other types of fractures in skull vault like pond and gutter fractures were not recorded in the present study.

Table 2: Site of Fracture in Vault

Site of fracture in vault	No. of cases (n=286)	Percentage
Frontal	57	20%
Parietal	64	22.3%
Temporal	65	22.7%
Occipital	28	9.8%
All bones	39	13.6%
Facial bones	7	2.4%

On analysis of the fractures of skull based on the bone involved in the fracture, it was observed that temporal bone/s were fractured in 65 cases (22.7%) followed by parietal bone/s in 64 cases (22.3%) and frontal bone in 57 cases (20%). All bones were involved in 39 cases (13.6%) followed by occipital bone in 28 cases (9.8%) and facial bones were involved in 7 cases (2.4%). Involvement of base of skull was seen in 167 fractures out of 286 cases. Middle cranial fossa fracture was seen in 117 cases (40.9%) followed by posterior cranial fossa in 109 cases (38.12%) and Anterior cranial fossa was involved in 84 cases (29.3%). Intra-cranial hemorrhage was seen in 255 cases (89%) out of total 286 cases. SAH was seen in 249 cases (87%) followed by SDH in 209 cases (73%). IVH was seen in 68 cases (23.8%) and EDH in 17 cases (5.9%).

Table 3: Type of Intracranial Hemorrhage

Type of Intracranial Hemorrhages	No. of cases (n=286)	Percentage
EDH	17	5.94
SDH	209	73
SAH	249	87
IVH	68	23.8

On considering the type of brain injury, the most common type of injury was cerebral oedema in 105 (36.7%) cases followed by combination of contusion, laceration and oedema seen in 43 (15%) cases. Contusion of the brain was seen in 42 (14.7%) cases followed by laceration alone in 8 (2.8%) cases. Brain had been expelled out of the cranium in 23 (8%) cases. When the sites of brain injuries were analyzed in total of 286 cases, brain injuries were present in 221 cases and whole brain was injured in 93 cases (32.5%), frontal region in 34 cases (11.9%), a

combination of frontal and temporal region in 33 cases (11.5%), temporal region alone in 21 cases (7.3%), base of brain in 11 cases (3.8%), occipital region in 9 cases (3.1%) and parietal region in 6 cases (2.1%). A combination of frontal and parietal region followed by temporal and parietal region were seen in 7 cases (2.4%) each.

Table 4: Site of Brain Injured

Site of Brain Injured	No. of cases	Percentage
Absent	65	22.7%
Frontal	34	11.9%
Temporal	21	7.3%
Parietal	6	2.1%
Occipital	9	3.1%
Base of Brain	11	3.8%
Frontal+ Temporal	33	11.5%
Frontal+ Parietal	7	2.4%
Temporal+ Parietal	7	2.4%
Diffuse	93	32.5%
Total	286	100%

In most of the cases that is in 140 cases (49%), death had resulted within hours following the incident and in 106 cases (37%) the victims had survived in days. The death had occurred immediately in 40 cases (14%) following the incident.

When cause of death was analyzed, it was noted that in 244 cases (85.3%) death was due to head injury alone. In 31 cases (10.8%) death was due to multiple injuries sustained and in 11 cases (3.9%) death was attributed as instantaneous death due to crush injury sustained to the head.

DISCUSSION

Road traffic injuries are one of the top three causes of death among individuals aged between 5 and 44 years and more people die in road accidents in India than anywhere else in the World.¹Head is the most common site to be injured in road traffic accidents. Presence of skull fractures in cases of fatal head injuries is not a rule. In this study, it was observed that linear fractures were the commonest fracture, accounting for 35.7% of cases. The findings were similar to the study done in Bangalore, where they observed that fissured fracture was the most common fracture in 41% of cases. Comminuted fracture was seen in 14.4% of cases in the present study which was in contrast to the study done in Bangalore wherein they observed comminuted fracture in 30% of cases.⁵ On considering the site of fractures in skull vault the present study showed involvement of temporal bone/s in majority of cases 22.7% followed by involvement of parietal bone/s in 22.3% cases and frontal bone in 20% cases. All bones were involved in 13.6% of cases followed by occipital bone in 9.8% cases and facial bones in 2.4%

cases. Similar results were drawn from the studies done in Delhi and Jaipur, wherein temporal bone was the most commonly involved bone followed by parietal bone/s.^{6,7} The base of skull fractures in this study involves middle cranial fossa in most of the cases 40.9% followed by posterior cranial fossa in 38.12% cases and anterior cranial fossa in 29.3%. This study was similar to the study done in northeast Delhi, which had shown that posterior cranial fossa involvement in 40% of cases being common followed by anterior cranial fossa involvement in 20%.⁸ The commonest intracranial hemorrhage in this study was subarachnoid hemorrhage in 87% of cases, followed by subdural hemorrhage in 73% of cases, intraventricular hemorrhage in 23.8% of cases and extra-dural hemorrhage in 5.9% of cases. The present study showed the similar findings as seen by Pillay VV.⁹ In the present study on considering the type of brain injury, it was observed that cerebral oedema was seen in 105 cases (36.71%), followed by a combination of contusion, laceration and cerebral oedema in 43 cases (15.1%), contusion alone in 42 cases (14.7%), laceration in 8 cases (2.8%) and brain was expelled out in 23 cases (8%). This was similar to the study done in Chandigarh where the cerebral oedema was the major contributing factor towards death seen in 166 cases (45%) followed by cerebral contusions and lacerations seen in 87 cases (24%).¹⁰ The present study showed the diffuse involvement of whole brain in 93 cases (32.5%) followed by frontal lobe alone in 34 cases (11.9%) and frontal and temporal lobe in 33 cases (11.5%). Similar results were observed in a study done in Bangalore, where they showed diffuse involvement of brain in 39 cases (34%) followed by frontal lobe in 24 cases.⁵ When the duration of survival was analyzed in this study, it was found that most of the cases died within hours of accident seen in 140 cases (49%) followed by death which occurred within days in 106 cases (37%) and death which occurred immediately in 40 cases (14%). Similar results were drawn in a study done in Maharashtra, wherein they found 39.57% died while on the way to hospital followed by 34.76% died in the hospital and 25.67% died on spot and head injury was the most common cause of death followed by injury to other vital organs.¹¹ When the cause of death was analyzed in this study, it was observed that 244 cases (85.3%) died as a result of head injury alone followed by death due to multiple injuries sustained to the body in 31 cases (10.8%) and in 11 cases death was attributed as instantaneous due to crush injury sustained to the head. There were no similar or contrasting studies to comment on this issue. There was no uniformity of findings with regard to conclusion of cause of death. In most of the cases mode of death was included along with the cause of death. Until we have uniform standards for

concluding cause of death, comparison of such data may not be possible.

CONCLUSION

Dominant type of skull fracture found was the linear fracture in 102 cases (35.7%) followed by comminuted fractures in 41 cases (14.4%). On considering the most common site of fractures in the vault, temporal bone/s getting fractured was seen in majority of the cases (22.7%). Parietal bone/s and frontal bone fractures were the next commonly seen in 22.3% and 20% of cases respectively. Subarachnoid hemorrhage was the commonest intracranial hemorrhage seen in 87% of cases. Since fatal head injuries are the major cause of death it would be beneficial to educate the general public regarding management of such cases and also educate them of traffic emergencies (first aid) will be of high value.

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